A STUDY OF THE RELATIONSHIP OF ENGLISH COMPREHENSION LEVEL AND ACADEMIC PERFORMANCE OF FOREIGN STUDENTS IN THE NAVAL POSTGRADUATE SCHOOL

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THESIS

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In this study, English comprehension level test scores of foreign students were correlated with the final academic

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I. INTRODUCTION

A. GENERAL

Many factors determine the academic achievement of a student. If the learning situation is in a foreign country, adequate communication capability would be a most critical and basic requirement for successful performance by foreign students.

This study was intended to investigate and evaluate how the English language comprehension levels of foreign students from countries where English is not the principal language are related to their academic performance at the Naval Postgraduate School (NPS).

This study will also provide an occasion to examine the effectiveness of a current English comprehension level test in predicting academic grades in the postgraduate study at the NPS.

B. DEFINITIONS

1. Foreign Student - A person from a country where English is not the principal language and who is required to take a English comprehension level test to study at NPS.

2. Quality Point Rating (QPR) - A student's overall academic grade average computed from the numerical standards established by the NPS. (See Chapter III.B)

3. English Comprehension Level (ECL) - A numerical grade of English proficiency converted to qualification

levels, as established in a numerical system by the Defense Language Institute (DLI) to show the English language capability of non-English speaking nationals. (See Chapter III.B.)

C. VALUE OF THE STUDY

All foreign students are required to have a certain English language capability in order to be admitted to the schools in the United States, but the facility with which one communicates in a foreign language rarely equals that in his native tongue. Hence, one can expect English language deficiencies to be a problem among foreign students.

Without a sincere understanding of the language problem, there might exist not only an unintentional collision of feelings, but also discrimination in evaluating students. Grades may sometimes be inflated due to the tendency of professors to be quite lenient in evaluating foreign students, or sometimes grades may be deflated because the same norms may be used for all students.

The findings of this study may suggest some ideas for school authorities in setting up policies concerning foreign students, and for the agencies responsible for the English proficiency test to review the measures of English capacity of foreign students admitted to various levels of schools in the United States.

Further, this study may help individual foreign countries examine their screening procedures for their candidates to enter NPS.

This study will also provide some basis for further study in determining factors predictive of academic achievement of non-English speaking nationals at the NPS.

II. STATEMENT OF THE PROBLEM

A. THE PROBLEM

Because of a lack of proficiency in English, many foreign students in the United States have difficulty in making a satisfactory adjustment to not only their academic work but also to their daily associates. It is hardly an exaggeration to say that during the foreign students' sojorn in the United States, everything hinges on his ability to communicate adequately -- with his teachers, his books, his fellow students, and his associates in daily life. Most of what he learns must be filtered through a communication process, and good communication provides the setting in which other problems of adjustment are most easily solved, while blocked or distorted communication can give rise to a vicious spiral of other personel difficulties.

Edward Cieslals stated, in his study of Foreign Student in American Colleges, that of a dozen qualifications which collegiate institutions consider desirable for the admission of foreign students, sufficient mastery of English to enable them to carry a full program is rated most important [Ref. 1].

A Department of Defense Study in 1965 determined that 53 percent of the military students programmed annually for technical/professional training in the U.S. service schools had English comprehension below the level required for successful understanding of course offerings. This did

not mean that the students were necessarily given failing grades [Ref. 2].

The brief discussions which have been presented thus far give rise to a number of questions such as, How can one measure or determine adequacy of English capability for foreign students being educated in the United States?, To what degree is a student's success in a given course based on his comprehension of English?, Can a student's level of English comprehension provide some basis for predicting his success in a formal training course?, Are the objectives of foreign training being achieved?

This thesis is concerned with the problem of investigating and evaluating the relationship of the English comprehension level of foreign students with their academic performance at the Naval Postgraduate School.

If a relationship between English proficiency and achievement in courses were determined, it would be possible to provide a means for screening candidates for study and predicting their academic success at NPS.

B. ASSUMPTIONS AND LIMITATIONS

Some assumptions and limitations were taken into account during inquiring into the problem. These assumptions and limitations are as follows:

1. As most of the curriculla at NPS are 18 months or longer in length, foreign students quite possibly increase their English proficiency during their time in the United States. The degree of improvement may be different depending

upon an individual's dilligence, intelligence, personality, motivation, etc., and the additional language proficiency could affect his academic achievement. It was assumed, however, that the original ECL score of a foreign student acquired prior to entry into NPS might be a valid predictor of his NPS performance.

2. Many factors which could affect a foreign student's academic success at NPS, such as individual background, family status, ethnic and national characteristics, economic and social status, and motivation, are ignored, and only English proficiency as represented by ECL scores was related to academic performance in this study.

3. The prevailing system of assigning alphabetical course grades probably does not effectively discriminate between students whose performance is not the same. This is because identical grades may be assigned to students even though their performance covers a relatively wide range. Fluctuations of grading policies from one class to another, and from one professor to another, also tend to distort the validity and reliability of grades.

4. Because of admission policies, foreign students coming to the NPS all had ECL scores of 80 or higher, the frequency distribution of the test scores (ECL) was skewed. This restriction of range tends to lower the correlations between ECL and other variables [Ref. 3].

5. Sampling for this research was limited to only the recent two years of graduation classes as descriptions for

personal data preceding those classes were not available. This limited sampling may not be representative of the whole universe of foreign students able to come to NPS.

6. It was hypothesized that the relationship of English comprehension to academic grades would be stronger in the curricula having many verval or administrative type courses than in the curricula relying very heavily on mathematics or engineering type courses. This hypothesis was examined by dividing the sample into engineering and non-engineering curricula groups.

7. It was also decided to investigate whether any differences existed between student's military rank. This was examined by comparing the statistical results of two rank groups, one with ranks of Lieutenant and below and another with ranks of Lieutenant Commander and above.

C. RELATED STUDIES PERTINENT TO THE PROBLEM

1. The Army Study - A George Washington University Study by Dr. George H. Brown (the Brown Study) was concerned with foreign students in U. S. Army schools [Ref. 4]. The objectives of the research were to assess the academic achievement of foreign students in four selected U.S. Army schools and to investigate the relationship between English language proficiency and academic achievement. The sample included 1,159 foreign students representing 49 countries throughout the world.

This study revealed that 70.2 percent of the foreign students were seriously handicapped by English language

deficiency, and if standards for United States students had been rigidly enforced, 22 percent of all courses completed would have been failed: included in the failures would have been 51 percent of the students who had poor English proficiency and 15 percent of the students who had excellent English proficiency as judged by the instructors.

The report concluded that the actual educational or training objective of the foreign student training program was not being met, and that English language deficiency was a significant factor in the underachievement of foreign students.

The findings and conclusions of the Brown study were later strongly supported by a Department of Defense Study of English Language Training of Foreign Students [Ref. 5].

2. The Air Force Study - Ralph C. Erchinger conducted a study on English comprehension level as a predictor of achievement for foreign military in training in the Undergraduate Pilot Training Course of the United States Air Force [Ref. 6]. He investigated the relationship of English proficiency, as measured by ECL, with the academic and flying training achievements of foreign students.

The sample included 169 foreign student pilots trained in the Undergraduate Pilot Training T-28 Course from January 1965 through September 1966.

The study did not accept the following hypothesis because of the low correlation: ECL may be used to predict a foreign student's technical flying training or his final flying training grade. However, another hypothesis, ECL

may be used to predict a foreign student's final academic grade, was accepted, based upon a correlation coefficient of .7425, which was sufficiently high to provide for meaningful prediction of academic grades from ECL scores.

The study concluded that proficiency in the English language, as measured by the ECL, may be considered as an important contributing factor in the prediction of academic success in Undergraduate Pilot Training.

3. Other Social Studies - Besides the ECL described previously, several tests of English ability have been constructed specifically for use with foreign students entering university training. Among these tests are the Test of English as a Foreign Language (TOEFL), the University of Michigan Tests (the Lado Test) developed at the English Language Institute at Michigan, and the Pennsylvania State University English Language Proficiency Test.

These tests, as predictors of success for foreign students, were evaluated by Chase and Stallings in an Indiana University Monograph. Their data were from 526 foreign students [Ref. 7].

They found that the TOEFL and the Pennsylvania State English Language Proficiency Test were not significantly correlated with grade point average (GPA). Correlation coefficients from .1963 to .2273 were found to be significant in the research, but these correlations were evaluated as too low to have practical effectiveness.

Chase and Stallings concluded that the tests predicted achievement in only a casual way, and they suggested that

there is little prospect for relating scores on tests in English with a subsequent GPA in college.

Walter P. Allen investigated the relationship of Lado test scores with first semester grades of ninety students at the University of Houston [Ref. 7]. This study showed product-moment correlations coefficients between .21 and .32, and the study indicated that there is a slight correlation between the English test scores and grades made at the University. The correlations were especially marked when only English grades were considered.

In summation, all the above studies showed a positive correlation between a foreign student's English facility and his academic adjustment, but the results of these studies were not conclusive. They showed that the correlation of English proficiency to academic achievement of students at military schools was stronger than at universities and colleges.

III. EXPERIMENTAL DESIGN AND PROCEDURES

A. POPULATION AND SAMPLE

1. Population

The population for this study was considered to be of infinite or indeterminate size, including all foreign students who had entered the graduate courses of NPS in the past, or who would enter the NPS in the future. The size of the population largely depends upon the quota available at the NPS and the policies of the United States and the individual foreign countries.

2. Sample

Table I shows the number of and percent of foreign students graduated from NPS during the period of academic year (AY) 1973 and 1974, which depicts approximately 10 to 15 percent of foreign students in each class of the year.

Table I. Number and percent of foreign students graduated during AY-1973 and AY-1974.*

Graduate Class	Total Number of Graduates	U.S. Students	Foreign Students	
			Number	Percent
AY-1973	710	641	69	10.7
QTR-I	122	106	16	15.1
QTR-II	189	164	25	15.2
QTR-III	169	165	4	2.4
QTR-IV	230	206	24	11.7
AY-1974	543	469	74	15.8
QTR-I	149	126	23	18.3
QTR-II	108	88	20	22.7
QTR-III	125	116	9	7.8
QTR-IV	161	139	22	15.8
Total	1,253	1,110	143	12.9

*Compiled from the roster filed in the Registrar's Office, Naval Postgraduate School.

The eight consecutive NPS graduate classes of 1st Quarter, AY-1973 through 4th Quarter, AY-1974, which correspond to graduation classes of September 1972 through July 1974, constituted the sample representing the indeterminate population of all foreign students.

Purposive sampling was used because transcripts of foreign students having ECL scores recorded on them were not available for graduate classes preceding September 1972.

The sample included 110 foreign students representing 17 countries throughout the world as shown in Table II. This was the maximum size of sample available at the present time, as there were some students from countries where the ECL test was not required, or whose transcripts were missing.

Table II. Number and source of foreign students included in the sample: by country

Country	No. Students	Country	No. Students
Argentina	1	Korea	10
Brazil	6	Peru	10
China	5	Portugal	3
Chile	4	Thailand	15
Ecuador	1	Turkey	14
Greece	8	Urguay	3
Indonesia	7	Venezuela	3
Iran	2	Vietnam	17
Japan	1	Total	110

The English proficiencies of foreign students as measured by ECL scores were obtained from records on file at the NPS Military Personnel Office, and the final average

Table III. Number of foreign students included in the sample: by ranks*

LT	LCDR	CDR	CAPTAIN	TOTAL
56	36	15	3	110

*Rank shown is the rank held upon reporting to the Naval Postgraduate School

*Ranks of other services than Navy are converted to the Navy equivalent

Table IV shows the constitution of the sample by academic year and curriculum.

Table IV. Constitution of the sample by class and curricula.

Department	Curricula	No. Students Graduated in AY-1973	AY-1974	Total
Operations Research & Administrative Sciences	Operations Research	14	24	38
	Management	9	5	14
	Computer Science	2	1	3
	Computer Systems Management	4	4	8
		29	34	63
Engineering	Electrical Engineering	15	18	33
	Mechanical Engineering	12	2	14
		27	20	47
Total		56	54	110

QPR values were obtained from the student performance records on file at the Registrar's Office, NPS. Both sets of data are listed in Appendix C, using a student identification code number randomly assigned to each student to preserve anonymity.

B. TEST AND MEASUREMENTS

To investigate the relationship of English proficiency and academic success of foreign students, two variables were used in correlational analysis: the set of ECL scores as the independent variable, X, and the set of QPR values as the dependent variable, Y. These data were tabulated for statistical analyses using two packaged sets of computer programs: the Statistical Package for the Social Science (SPSS) [Ref. 9] and the Job Library for the Statistical Program (STATLIB) [Ref. 10].

The nature of these two variables will be discussed below.

1. ECL Test

The ECL test is a primary quality control system conducted by the Defense Language Institute at the English Language School, Lackland Air Force Base, Texas and at many overseas Military Assistance Advisory Group and Missions.

The ECL is used to screen applicants from non-English speaking countries for military training in the United States.

In light of the importance of English as a primary communication media for training in the United States, the

U.S. Department of Defense specifies that a knowledge of English language is a prerequisite for foreign students to attend schools in the United States and requires that all students must obtain passing scores on the English Comprehension Level Test.

An ECL test takes about 60 minutes to administer, and tests reading and listening comprehension. The results of the test range from zero to one hundred points which are translated into qualification levels as established in a numerical system by DLI. For instance, an individual with a 70 ECL knows much more than twice the amount of English compared to one with a 35 ECL, and the progressive proportions between a 45 and 90 ECL are not the same as those between 35 and 70 ECL.

The minimum ECL requirements for entry into various schools in the United States are determined by the schools of each different service and confirmed by the DLI Headquarters. Various levels of English comprehension are defined as follows [Ref. 11]:

0 - 39 ECL	: beginning language students
40 - 59 ECL	: elementary-intermediate level
60 - 69 ECL	: qualification level for low-level or apprentice specialized training
70 - 79 ECL	: qualification level for beginner courses where the language limitation is critical
80 ECL and above*	: qualification level for professional career and advanced courses

*ECL required for entry into NPS belongs to this category

The psychometric characteristics of the ECL tests are shown in Appendix A.

2. Academic Success at NPS

A student's academic performance at the NPS is evaluated on the basis of a quality point number assigned to letter grade achieved in a course as follows [Ref. 12]:

Performance	Grade	Point Value
Excellent	A	4.0
	A-	3.7
	B+	3.3
	B	3.0
	B-	2.7
	C+	2.3
	C	2.0
	C-	1.7
	D+	1.3
	D	1.0
Failing	X	0.0

When the quarter hours value of a course is multiplied by the quality point number of the student's grade, a quality point value for the student's work in that course is obtained.

The sum of the quality points for all courses divided by the sum of the quarter hour value of all courses gives a weighted numerical evaluation of the student's performance termed the Quality Point Rating (QPR).

A student achieving a QPR of 3.0 has maintained a "B" average in all courses undertaken.

Academic success at NPS is defined as the successful completion of all courses of a curriculum, supported by a final minimum QPR of at least 3.0, and an approved thesis, if required.

C. ANALYTICAL PROCEDURES

1. Correlation Analysis

To investigate the relationship between the two variables, ECL and QPR, regression and correlation analyses was conducted. A standard statistical technique for evaluating the effectiveness of test scores for predicting achievement is the correlational validity coefficient.

Correlation coefficients provide indices of the extent to which excellence on one measure is associated with excellence on another measure, or, in other words the degree to which variables or measures vary together. Mathematically, the value of the coefficient may range from a perfect positive correlation (+1.0), through no relationship (0.0), to a perfect negative correlation (-1.0).

In general, when correlating variables, the coefficients indicate roughly the following strengths of relationships between the variables [Ref. 12]

Less than .20	---Slight, almost negligible relationship
.20 - .40	---Low correlation, definite but slight relationship
.40 - .70	---Moderate correlation, substantial relationship
.70 - .90	---High correlation, marked relationship
.90 - 1.00	---Very high correlation, very dependable relationship.

However the interpretation of the value of a correlation coefficient is purely relative to the circumstances under which it was obtained and should be interpreted in the

light of those circumstances. Many who have employed tests for vocational guidance or vocational selection have followed a tradition that the minimum validity coefficient for a test to be practically useful is about .45 [Ref. 13].

Recent experiences have shown that this standard can be too rigid. According to McKenna, it is noted that most validity coefficients developed by personnel research range from .25 to .50. Yet these validities can have practical value, and it is unusual to have a validity coefficient of more than .50 [Ref. 14].

The correlation coefficients for this study were calculated by SPSS using the Pearson product-moment method. Statistical results are shown in the tables and figures of Chapter IV.

2. Regression Analysis

While the correlation coefficient is a useful index for evaluating the correlation between variables, this information cannot give a clear picture of the predicted academic achievement of individual foreign students who scored at various levels on the ECL test.

However, through the use of regression analysis, such predictions can be accomplished by establishing a line of regression for ECL test scores versus academic grades. This linear function can be expressed as an albegraic equation $Y = a + bX$, which provides the estimate of an unknown variable Y when the value of another variable X is known [Ref. 15].

For each case of analysis, a scatter diagram was obtained with the dependent variable plotted on the ordinate and the independent variable along the abscissa to check for any curvilinear relationships, but none were found. The linear line of least squares was computed and plotted from the formula $Y = a + bX$ by substituting coefficients "a" and "b".

For the purpose of summarizing and displaying graphically the probability or likelihood of individual student's academic success, an individual expectancy chart was drawn from the scatter diagram. An expectancy chart is a graphic display of presenting the probability of attaining success associated with a given score range [Ref. 16].

IV. ANALYSIS OF THE RESULTS

A. ANALYSIS OF DATA

1. Relation of ECL to QPR

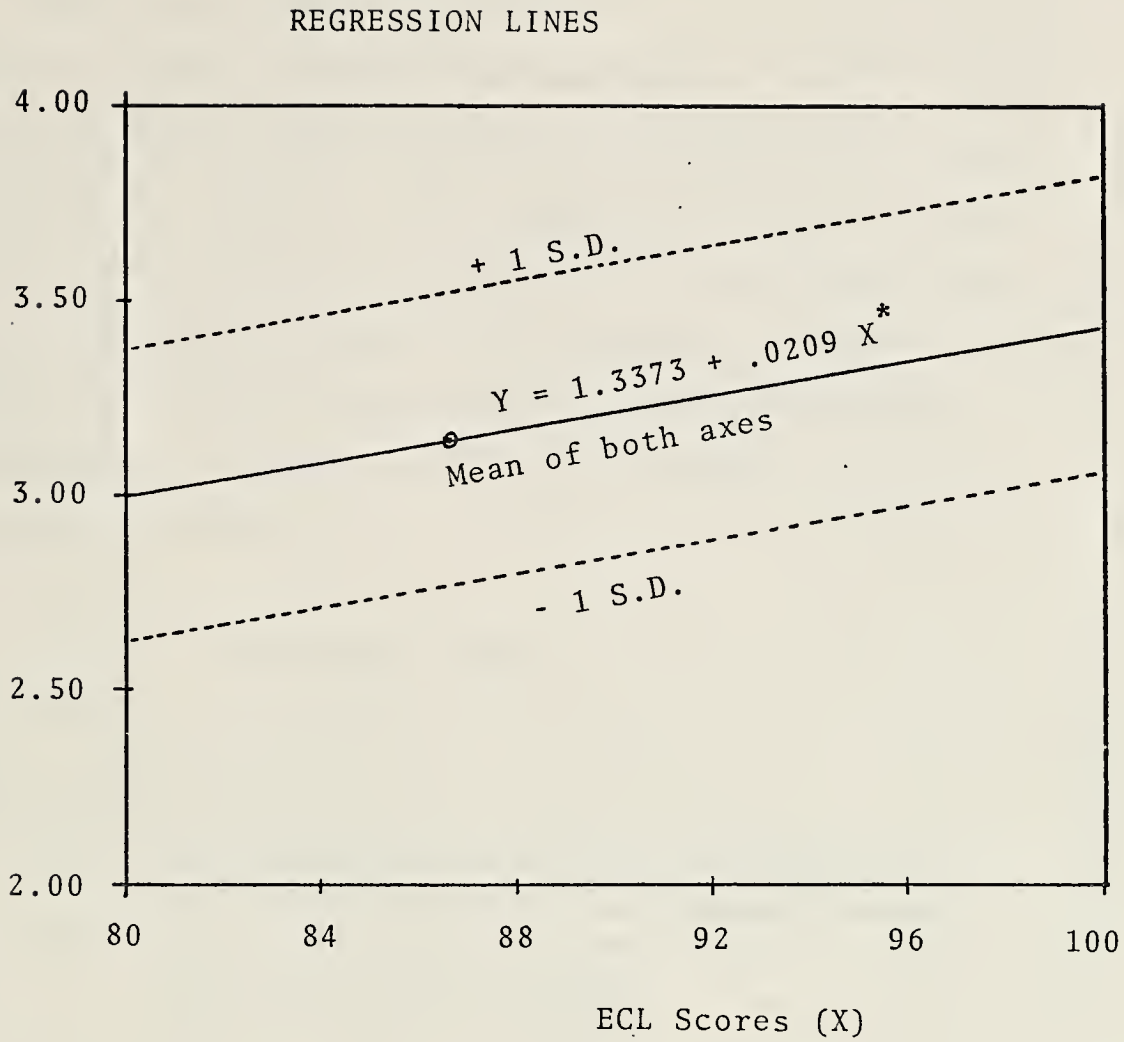
Table V contains a statistical summary of ECL and QPR. Considering the total sample, the validity coefficient of correlation was found to be .2897, which is significant at the .001 level.

To check for the reliability of the statistical results, these results were cross validated by dividing the sample into 56 students of the AY-1973 class as a developmental group and 54 students of the AY-1974 class as a validation group. The AY-1973 class showed a positive correlation of .3100, which is slightly higher than the coefficient .2626 for AY-1974.

Table V. Statistical summary of ECL and QPR.

	AY-1973	AY-1974	Total
Number of sample	56	54	110
ECL Mean	86.96	86.33	86.65
S.D.	5.93	4.94	5.45
Range	80-100	80-100	80-100
QPR Mean	3.17	3.13	3.15
S.D.	0.40	0.39	0.39
Range	2.25-3.97	2.25-3.97	2.25-3.97
Correlation Coefficient	0.31	0.26	0.29
Standard Error of Estimate	0.38	0.38	0.38
Confidence Band: Upper	3.55	3.51	3.53
Lower	2.79	2.75	2.77
Regression Intercept "a"	1.37	1.32	1.34
Regression slope "b"	0.02	0.02	0.02

Figure 1 shows the estimated regression line and associated confidence band.



*Regression coefficients a and b were significant at $\leq$ .001.

Figure 1. Estimated line of regression based upon 110 foreign students.

The regression line was determined by substituting computed values of regression coefficients a = 1.3373 and b = .0209 in the general equation Y = a + bX, and computed values of Y were determined and plotted as a solid line in Figure 1. The confidence band in the Figure 1 was established as plus and minus one standard deviation (standard error of estimate) and is represented by the dotted lines.

To show an individual's chances of academic success at NPS, the relevant data were tabulated and presented graphically as an expectancy chart in Figure 2, and as a tabulation in Table VI.

EXPECTANCY CHART

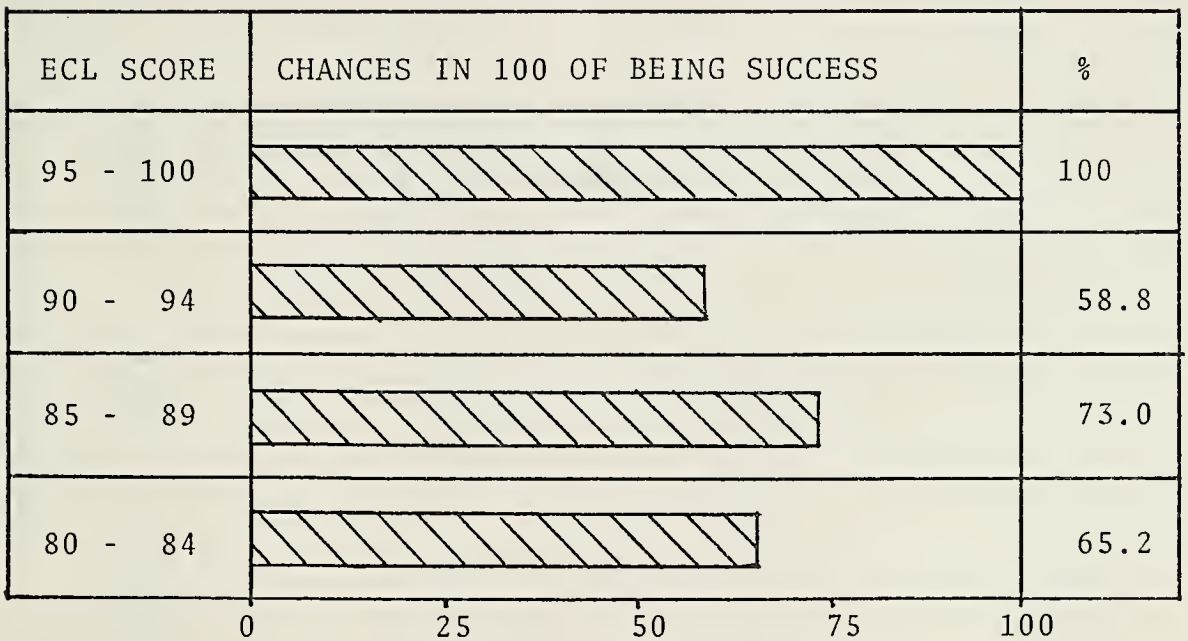


Figure 2. Expectancy chart for individual prediction of academic success based on 110 foreign students.

Table VI. Tabulation of the scatter diagram of ECL and QPR based on N = 110.

ECL Scores	No. of Success	No. of Fail	% of Success	ECL Scores	No. of Success	No. of Fail	% of Success
80	13	7	65.0	91	0	0	-
81	4	3	57.1	92	3	2	60.0
82	0	2	0	93	2	4	33.3
83	2	1	66.7	94	3	0	100.0
84	11	3	78.6	95	2	0	100.0
85	6	1	85.7	96	0	0	-
86	3	2	60.0	97	3	0	100.0
87	2	3	40.0	98	1	0	100.0
88	9	3	69.2	99	1	0	100.0
89	7	1	87.5	100	3	0	100.0
90	2	1	66.7	Total	77	33	70.0

2. Comparison of Curricula Subgroups

A comparison of the statistical results of the two major subgroups combining similar families of curricula was made in an attempt to see if there were any significant differences between engineering and non-engineering curricula. Table VII is a tabular summary of the relationship of ECL test scores and QPR values of the two different groups.

Table VII. Comparisons of statistical results of curricula subgroups.

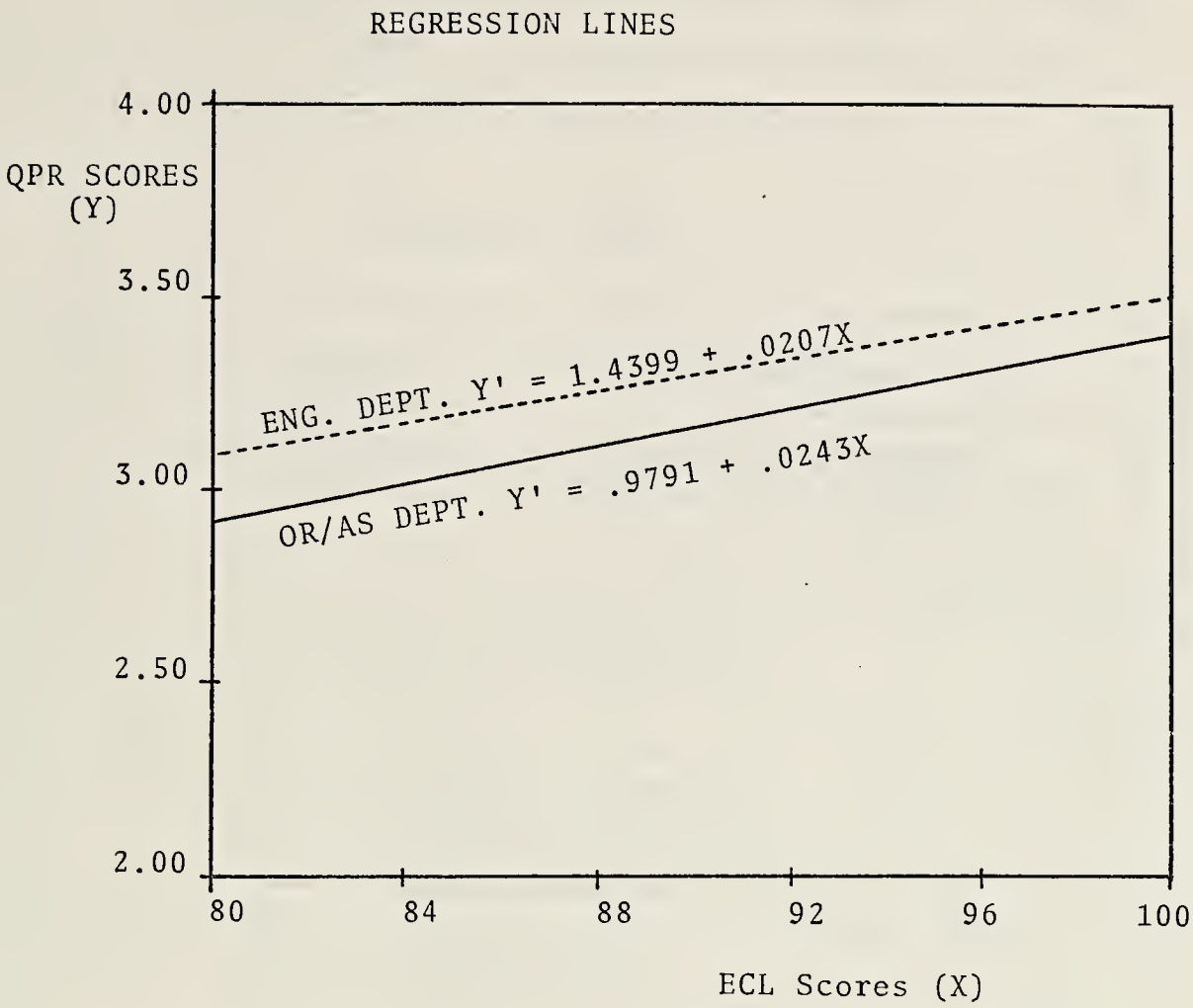
Subgroups by Curricula	OR/AS Dept.*	Eng. Dept.**
Sample numbers	63	47
ECL(X); Mean	87.2380	85.8723
S.D.	5.2570	5.6554
QPR(Y); Mean	3.0967	3.2174
S.D.	0.3880	0.3932
Correlation Coefficient	0.3289	0.2978
Standard Error of Estimate	0.3694	0.3795

* OR/AS means Operations Research/Administrative Sciences
**Eng. means Engineering

The mean ECL scores of students in OR/AS Department is 87.2380, which is slightly higher than 85.8723 of engineering curricula, while the final average QPR obtained by the students in OR/AS Department, 3.0967, is lower than the 3.2174 obtained in engineering curricula.

The correlation of ECL test scores with QPR values in the OR/SA Department was .3289. This is slightly higher than the .2978 in engineering curricula.

The disparities between the results for these two groups are also depicted in Figure 3, with the estimated regression line of ECL and QPR for the OR/AS Department as



Note: Regression coefficients a and b were significant at < .02.

Figure 3. Estimated regression lines of two curricula subgroups (OR/AS Dept. N = 63, ENG Dept. N = 47).

a solid line and that of the Engineering Department as a dotted line.

Individual expectancy of academic success, as shown in Figure 4, is higher in the engineering curricula for student's whose ECL scores were under 90.

EXPECTANCY CHART

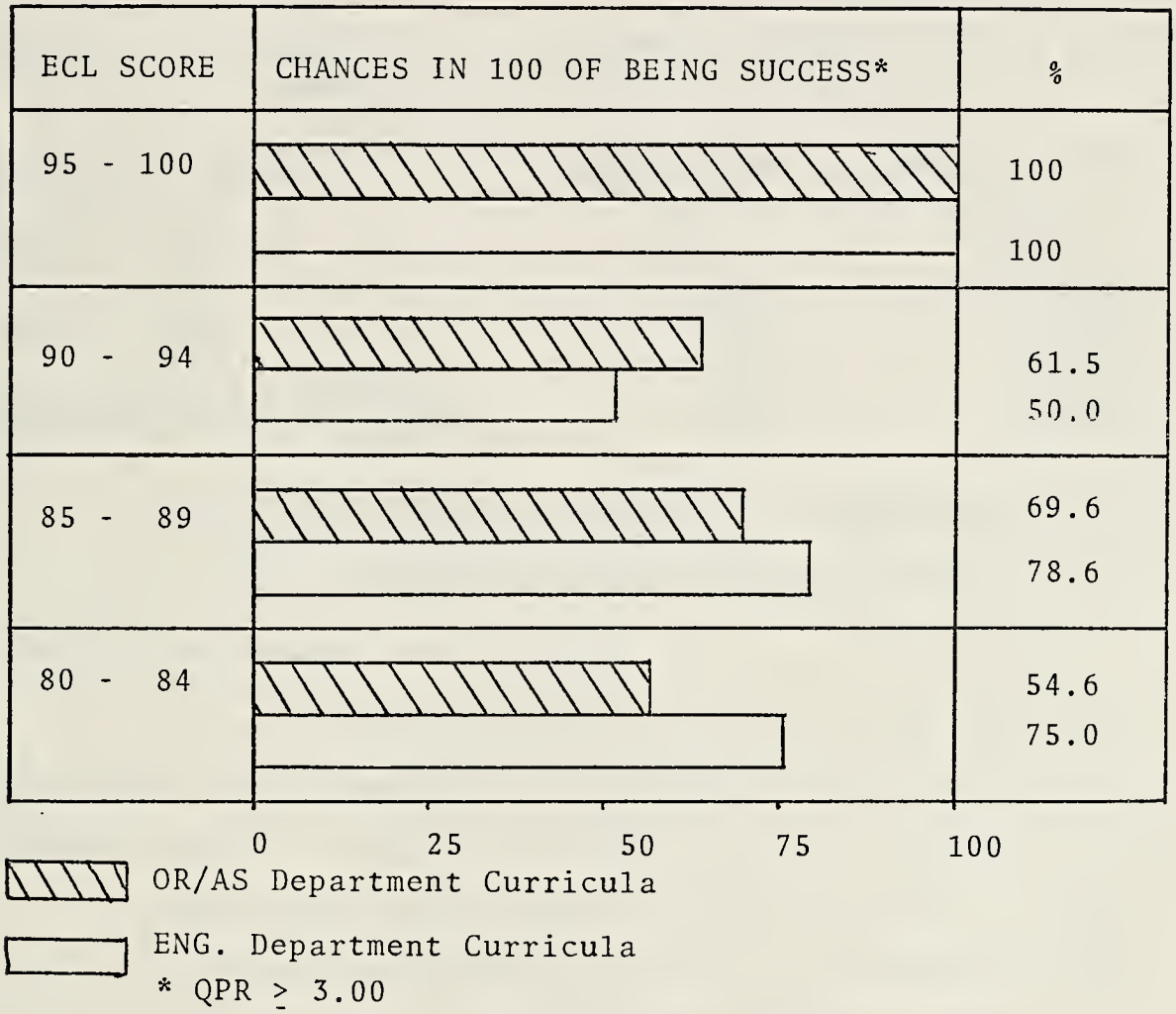


Figure 4. Expectancy chart for individual prediction of academic success in two curricula subgroups (OR/AS Department N = 63, ENG. Department N = 47)

3. Comparison of Rank Subgroups

In an attempt to see if there were any significant differences in the ECL-QPR relationship between foreign student's military ranks, a comparison of the statistical results of the two groups of rank, Lieutenant (LT) and below versus Lieutenant Commander (LCDR) and above, was conducted. Table VIII shows the results for the two groups.

Table VIII. Comparisons of statistical results of rank subgroups.

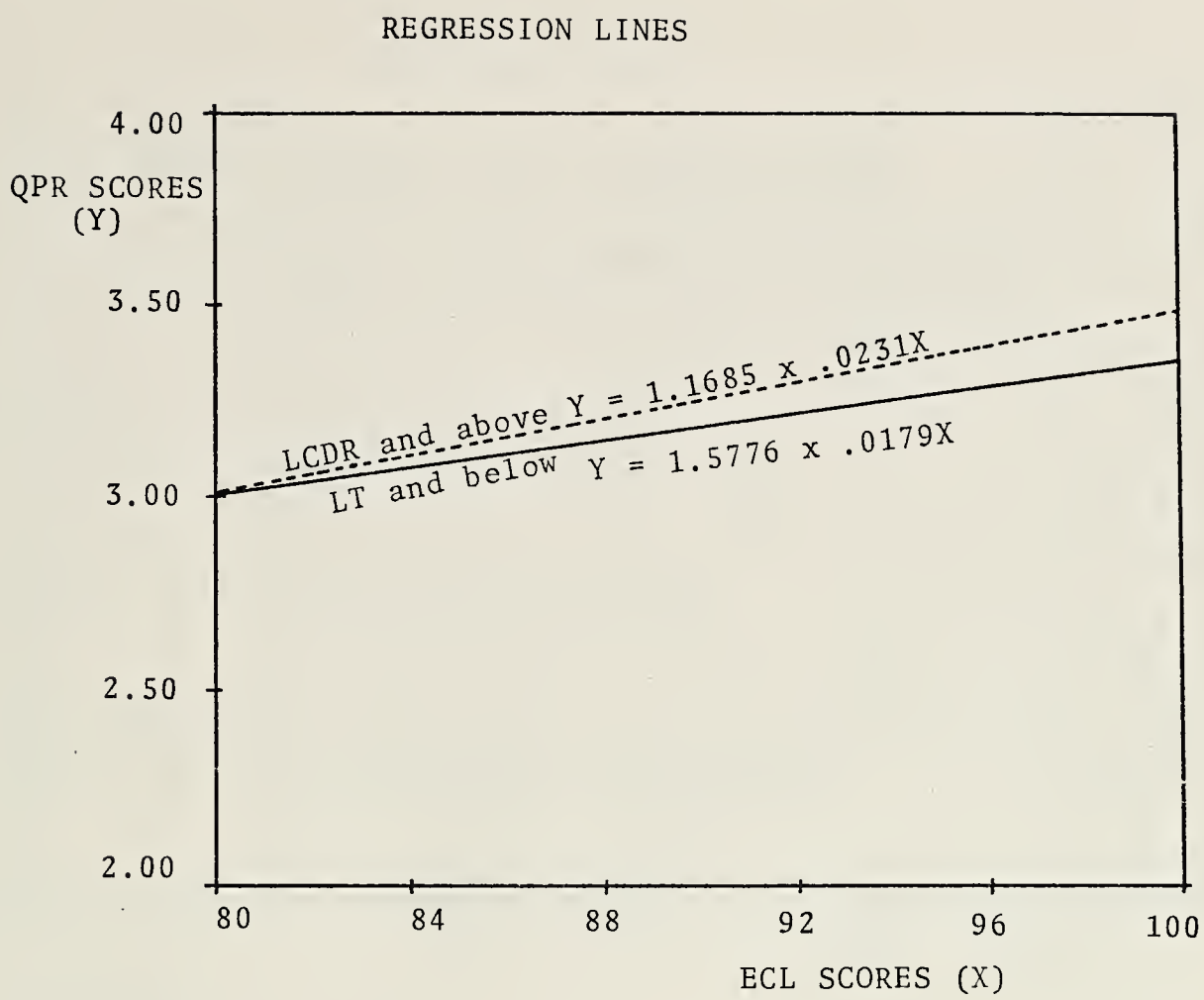
Subgroup by Rank	LT and Below	LCDR and Above
Sample Numbers	56	54
ECL(X); Mean	86.0357	87.2963
S.D.	5.4137	5.4587
QPR(Y); Mean	3.1148	3.1830
S.D.	.4140	.3707
Correlation Coefficient	.2336	.3398
Standard Error of Estimate	.4063	.3520

Those students with higher rank, LCDR and above, had a slightly higher mean ECL and mean QPR than those of lower rank, LT and below.

The correlation coefficient of ECL test scores with QPR values of the higher rank students is .3398, which is higher than the .2336 for the group of lower ranking students.

Regression lines of ECL and QPR for these two groups by rank are shown in Figure 5, with a solid line for LT and below, and a dotted line for the LCDR and above group.

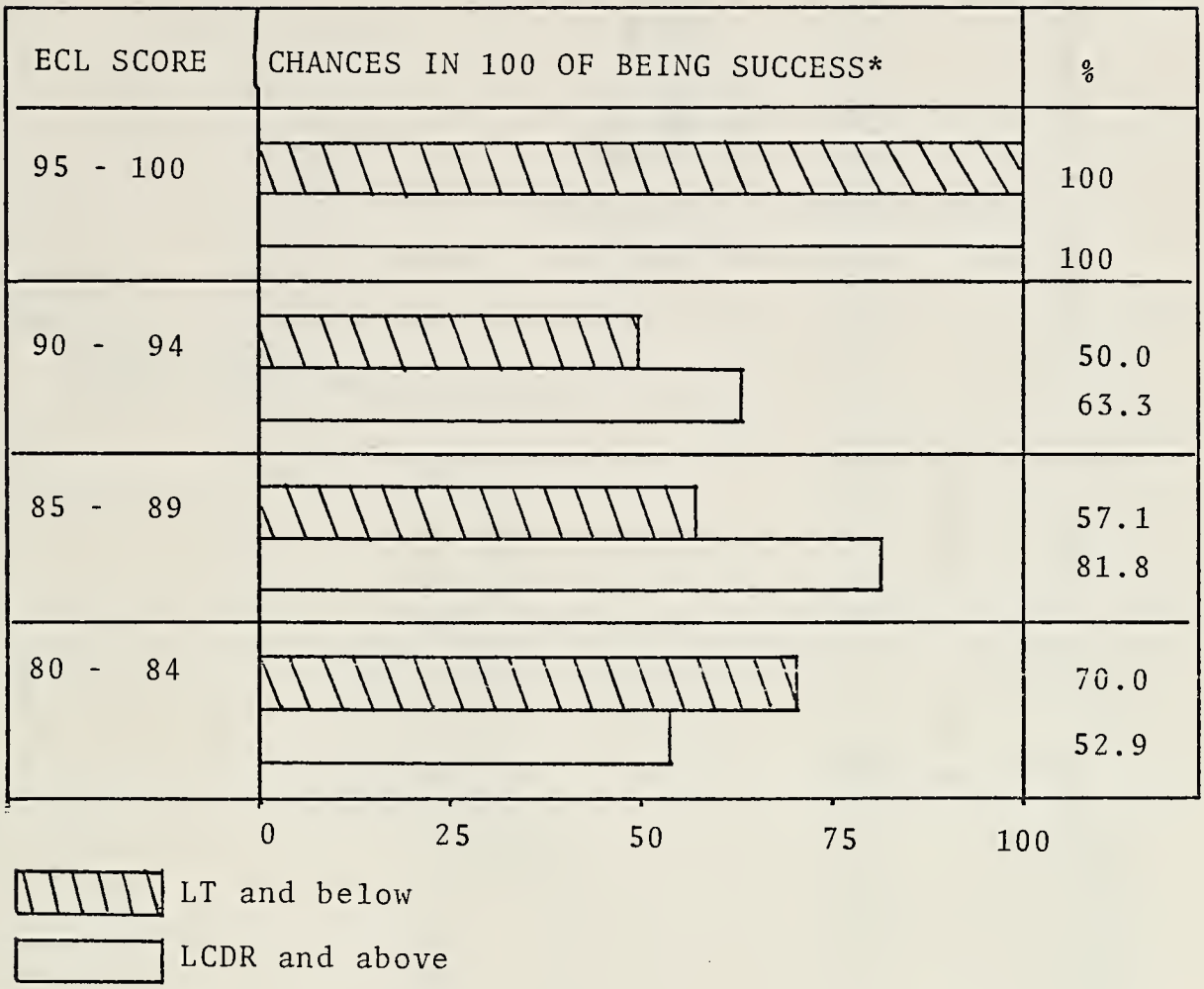
Individual expectancy of academic success in the two groups by rank is graphically presented in Figure 6. In addition, the probability of academic success in accordance with ECL cut-off scores established for selection purposes is shown in Figure 7.



Note: Regression coefficients a and b were significant at < .04.

Figure 5. Estimated Regression Lines of Two Rank Subgroups (Based upon LT and Below N = 56, LCDR and above, N = 54.)

EXPECTANCY CHART



* QPR $\geq$ 3.00

Figure 6. Expectancy Chart for indivisual prediction of academic success in two rank subgroups.

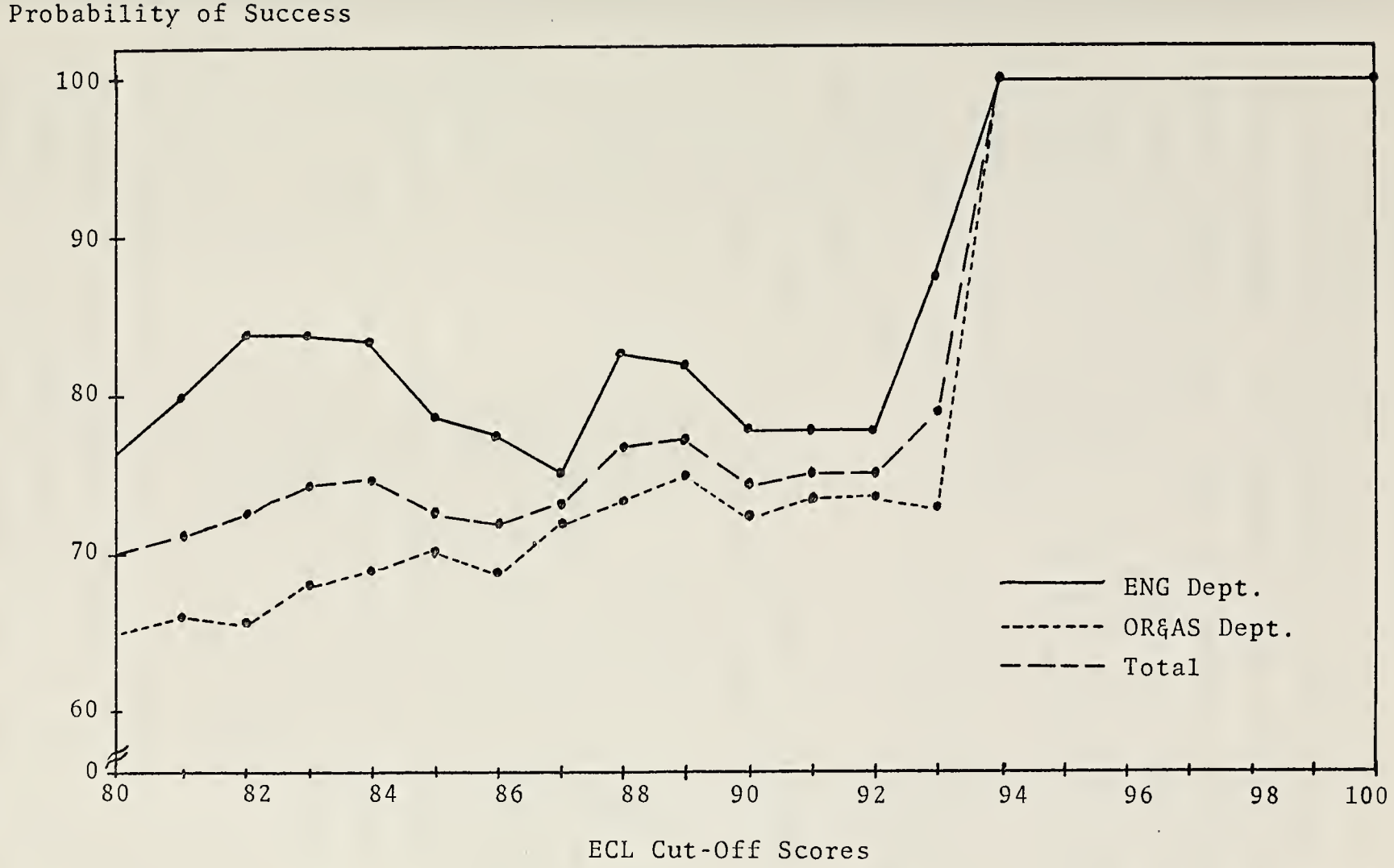


Figure 7. Probability of academic success Based upon ECL cut-off scores as established between 80 ECL and 100 ECL.
(OR/AS Dept. N = 63, ENG Dept. N = 47, Total N = 110.)

B. EVALUATION OF STATISTICAL RESULTS

As has been stated previously, the statistical data for the present analysis was generated from the sample of 110 foreign students. The frequency distribution of the academic grades (QPRs) was very close to a normal distribution, with a range of socres from 2.25 to 3.97, while that of the test scores (ECL) were skewed to the left toward 80, because the score of 80 was originally used as cut-off for minimum English language proficiency.

As shown in Table V, the correlation of ECL with QPR for the total sample was only .29, which is a definite but small relationship.

The standard error of the estimate was computed to be .3779, meaning that an estimated academic grade plus and minus .3779 would contain 68.27 percent of the true values. Using this confidence level, as shown in Figure 1, we can say we are 68 percent confident an individual's QPR will fall within the indicated band based upon his ECL test score, or, in other words, the individual has an 84 percent probability of achieving a QPR equal to or greater than that QPR indicated by the intersection of the lower confidence limit (minus one standard error), and his achieved ECL test score. However, based upon the total sample, the correlation of ECL test scores with foreign student's QPRs is not particularly high. This correlation was probably lowered by a restriction of range on the ECL scores. As shown in Figure 2, if an English proficiency of a foreign student were 95 ECL and above, he would have a perfect chance of

succeeding, or, otherwise, his chances of success would be around two out of three.

Analyses were also made by dividing the total sample into two different curricula subgroups: OR/AS and engineering. As depicted in Table VII and Figure 3, the comparison of the statistical results for these two subgroups reveals that English language proficiency is more predictive of performance in non-engineering curricula than in an engineering curricula. We may, therefore, expect that by using data generated for the two different subgroups, English proficiency for the student in administrative science type curricula should be higher than those in the engineering type curricula to achieve the same academic grades. Figure 3 bears out this belief.

Analyses were also conducted to compare the statistical results of subgroups by dividing the student's military ranks into two groups, LT and below and LCDR and above. The results of the analysis given in Table VIII shows that those foreign students with higher rank had a stronger correlation of ECL to QPR than did the lower rank group. This is evaluated as meaning that if present student assignment procedures were continued, students with ranks of LCDR or above would be expected to be more successful at NPS than officers of lower ranks.

In addition, further analysis were intended to check for effectiveness of different ECL cut-off scores for entry into NPS. Visualizing Figure 7, if the cut-off score for

entry into NPS, for instance, were set at 80 ECL and above, as it is at the present time, the probability of academic success would be 65.1 percent in OR/AS curricula, 76.6 percent in engineering curricula, and 70.0 percent as a whole.

The chart shows that these probabilities of academic success do not change immensely until the ECL cut-off score reaches 93 ECL and above, but at the cut-off score of 94 ECL and above the probability of academic success goes up to one hundred percent in both groups. In other words, the minimum ECL which would have one hundred percent chance of success was found to be 94, and no significant differences in success rates were found between scores of 80 and 93. This means that if the ECL cut-off score for selection of NPS candidates was set at 94 ECL and above, there would be no academic elimination at all.

Results of this study give some support to the effectiveness of the cut-off score of English comprehension level as measured by ECL and confirms that those who acquire ECL of 80 and above more often than not have the proficiency in English needed for success at NPS.

C. RELATED STUDIES COMPARED

As has been discussed in Chapter II.C, most studies of English proficiency have shown a relatively low correlation with the academic performance of foreign students in the United States.

As seen in Table IX, the probability of academic success of foreign students at NPS is 70 percent, which is comparable

to the 78 percent of the Brown study [Ref. 18] conducted at Army schools. The correlation coefficients of the present study of around .30 is comparable to, or slightly higher, than most of the previous studies except the unusually high correlation of .7425 found in the Erchinger study [Ref. 19]. At this point, the reader should recall that the correlation between ECL and QPR suffered in this study probably because of the restriction of range on ECL.

Table IX. Summary of Analogous Study Results.

Study By	Subjects	Test	Achievement	Correlation
Chase & Stallings	Indiana University N = 526	Lado	GPA	.1963~ .2273
Allen	University of Houston N = 90	Lado	GPA	.2100~ .3200
Brown	Army Schools N = 1159	Judge by Instructors	Pass/ Fail	78%
Erchinger	Air Force Undergraduate Pilot Training N = 169	ECL	Flying Training Academic Grade	.1970
			Final Grade	.7425
				.1729
Present Investigator	NPS Total N = 110	ECL	QPR	
	OR&AS N = 63		QPR	.2897
	ENG. N = 47		QPR	.3289
				.2978

The disparity in the predictive power of an English language test between verbal and written course work and technical instruction found in the Erchinger study, is more or less in agreement with the findings of the present study revealed in Table IX.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

This study was undertaken to investigate and evaluate the relationship of English comprehension levels of foreign students with their graduate academic performance at NPS.

To this end, ECL test scores of the foreign students obtained prior to the entry into NPS and their final QPR scores were used as variables for regression and correlation analysis.

The results obtained from the present study revealed a positive correlation of .2897 which is a statistically significant but marginally useful relationship between the ECLs and QPRs. The relationship was found to be slightly different for engineering, as compared to non-engineering curricula. It was stronger for students in the OR/AS curricula than for those in the engineering curricula, which means that some variables other than English proficiency, such as pre-knowledge in this field, strongly influence the academic performance of students in engineering curricula.

In addition, the comparison of the QPR-ECL relationship within different rank groups showed that foreign students with military ranks of LCDR and above obtained higher ECL test scores and higher final QPRs than those with ranks of LT and below. The relationship of ECL to QPR was also found to be higher for foreign students with higher ranks than for those with lower ranks.

Because the ECL scores were originally cut off at 80 or above, the predictive power of ECL as assessed by means of the ECL-QPR correlation was constrained by restriction of range.

However, the results of this study showed a 1.0 probability of academic success for those students who had received a 94 ECL or above prior to entry into NPS.

In general, the correlation coefficients which were found in the present study were not particularly high, but the results have to be judged on the basis of values ordinarily obtained in correlational analysis of this kind where restriction of range has operated.

B. RECOMMENDATIONS FOR FUTURE STUDY

1. It is recommended that future studies investigating the relationship of English language problems and the academic performance of foreign students in the Naval Postgraduate School, group the subjects by curriculum or group courses of study according to the characteristics of their contents, verbal and quantitative.

For those who may be interested in finding other predictors for the academic success of foreign students such as "age," "number of years after baccareaurate study," number of years in military service," "grade record and source of baccareaurate study," "military academy or civilian college," and "preschool experience of graduate level" may be useful predictors.

It is also recommended that the Naval Postgraduate School or interested students consider administering the Graduate

Record Examination (GRE) test to foreign students before or around the time they begin to study at the NPS and examine the GRE score as a possible predictor for academic performance by the follow-up method. The GRE test scores has been verified as an effective predictor for academic success of graduate level study by many earlier studies [Ref. 20].

If the GRE test scores were a good predictor, it might be suggested that the ECL test be replaced by the GRE test for the selection of foreign students for graduate study at the Naval Postgraduate School.

APPENDIX A: PSYCHOMETRIC CHARACTERISTICS OF THE ECL TESTS*

The statistical data of the series 6500 test forms A-F are as follows:

	A	B	C	D	E	F
Maximum Possible Score	100	100	100	100	100	100
Mean Score	60.3	59.5	62.0	60.0	62.3	62.6
Standard Deviation	20.9	20.6	20.3	20.7	20.1	23.5
Mean Difficulty Index	.62	.62	.63	.62	.64	.64
Mean Validity Index	.53	.51	.51	.52	.48	.57
Reliability Index for Internal Consistency (Kuder-Richardson formula #21)	.95	.95	.95	.96	.94	.97

Alternate-form Reliability Coefficient (Pearson Produce-Moment Correlation formula)	AxB	BxC	BxD	DxE	ExF
	.94	.95	.96	.95	.96

*1. Source: Information on ECL Tests, DLIEL-D, Defense Language Institute, Department of the Army, 26 August 1974

*2. Validation Procedure

Six preliminary forms of the ECL tests were constructed with 150 questions in each form. After presenting them to 1,200 Army, Navy and Air Force students representing 35 different countries, each form was revised and shortened to a 100-item test. Each item was checked for content validity, difficulty level and discriminating power. The items represent

a sample of material found in the American Language Course. The 6500 ECL series were correlated with the 6200 ECL series, and the correlation coefficients ranged from .93 to .95, indicating a high correlation between the two series.

APPENDIX B: LIST OF SAMPLE ECL AND QPR SCORES

Student Identification Number	Graduate Academic Year	Curriculum	ECL Test Score	Total Average QPR
101	72-73	O.R.	93	2.60
102	"	"	88	3.03
103	"	"	95	3.35
104	"	"	84	3.23
105	"	"	92	3.65
106	"	"	86	2.71
107	"	"	92	3.15
108	"	"	93	2.91
109	"	"	80	3.34
110	"	"	85	2.48
111	"	"	82	2.42
112	"	"	81	2.43
113	"	"	84	2.50
114	"	"	84	2.32
115	"	General Management	85	3.60
116	"	"	100	3.65
117	"	"	94	3.57
118	"	"	89	3.37
120	"	"	80	3.40
121	"	"	85	3.18
122	"	"	80	3.27
123	"	"	90	3.33
124	"	Computer Management	89	3.17
125	"	"	84	3.10
126	"	"	81	3.21
127	"	"	86	3.24
128	"	"	94	3.50
129	"	"	87	3.12
201	"	Electrical Engineering	88	2.25
202	"	"	98	3.54
203	"	"	84	3.87
204	"	"	93	3.47
205	"	"	86	3.09
206	"	"	80	3.11
207	"	"	92	2.90
208	"	"	80	3.09
209	"	"	97	3.71
210	"	"	97	3.93
211	"	"	88	3.11
212	"	"	81	3.15

Student Identification Number	Graduate Academic Year	Curriculum	ECL Test Score	Total Average QPR
213	72-73	Electrical Engineering	80	2.84
214	"	"	81	2.91
215	"	"	84	3.26
216	"	Mechanical Engineering	84	3.49
217	"	"	95	3.14
218	"	"	80	2.86
219	"	"	80	3.33
220	"	"	86	3.34
221	"	"	80	3.16
222	"	"	88	3.24
223	"	"	80	3.02
224	"	"	93	2.49
225	"	"	89	3.49
226	"	"	83	3.71
227	"	"	80	3.34
301	73-74	O.R.	80	2.88
302	"	"	84	3.33
303	"	"	93	2.90
304	"	"	89	3.97
305	"	"	83	3.16
306	"	"	83	2.80
307	"	"	97	3.43
308	"	"	87	2.92
309	"	"	99	3.07
310	"	"	85	3.52
311	"	"	90	2.92
312	"	"	81	3.01
313	"	"	86	2.90
314	"	"	92	2.68
315	"	"	80	2.90
316	"	"	92	3.12
317	"	"	94	3.48
318	"	"	89	2.92
319	"	"	80	3.09
320	"	"	89	3.10
321	"	"	84	2.34
322	"	"	82	2.45
323	"	"	88	2.57
324	"	"	88	2.25
325	"	General Management	85	3.21
326	"	"	88	3.54
327	"	"	88	3.47
328	"	"	89	3.41
329	"	"	90	3.35
330	"	Computer Management	80	2.76

Student Identification Number	Graduate Academic Year	Curriculum	ECL Test Score	Total Average QPR
331	73-74	Computer Management	84	3.58
332	"	"	85	3.28
333	"	"	88	3.28
334	"	"	81	3.07
401	"	Electrical Engineering	88	3.61
402	"	"	80	2.40
403	"	"	89	3.21
404	"	"	84	3.29
405	"	"	93	3.29
406	"	"	87	2.94
407	"	"	88	3.57
408	"	"	84	3.23
409	"	"	80	3.38
410	"	"	80	3.49
411	"	"	84	3.07
412	"	"	87	3.20
413	"	"	88	3.89
414	"	"	81	2.83
415	"	"	85	3.49
416	"	"	80	3.01
417	"	"	87	2.81
418	"	"	100	3.51
419	"	Mechanical Engineering	80	2.33
420	"	"	84	3.83

LIST OF REFERENCES

1. Edward C. Cieslals, The Foreign Student in American Colleges, Wayne University Press, Detroit, 1955.

2. Operation M-DAP, Foreign Aid Division, Department of the Army, Washington, D. C., 1953.

3. Robert L. Thorndike, Personnel Testing, John Wiley & Sons, Inc., New York, p. 170, 1949.

4. George H. Brown, The Achievement of Foreign Students in the U.S. Army Technical Schools, Human Resources Research Office, George Washington Univeristy, Alexandria, 1965.

5. Study of English Language Training Provided for Allied Students Under the Auspices of the Military Assistance Program, Department of Defense, Washington, D.C., 1965.

6. Ralph C. Erchinger, English Comprehension Level as a Predictor of Achievement for the Foreign Student Training in the United States, St. Mary's University, San Antonio, 1968.

7. Clinton, I. Chase and William M. Stalling, Test of English Language as Predictors of Success for Foreign Students, Bureau of Educational Studies and Testing, Indiana University, Bloomington, 1966.

8. Walter P. Allen, International Student Achievement, University of Houston, Houston, 1965.

9. Bent, D. H., Hull, C. E., and Nie, N. H., Statistical Package for the Social Sciences (SPSS), McGraw-Hill, 1970.

10. G. P. Learmonth, Technical Note No. 0211-22, Statistical Resources of the W. R. Church Computer Center, Naval Postgraduate School, 1974.

11. Information on ECL Tests, DLIEL-D, Defense Language Institute, Department of the Army, 26 August 1974.

12. Naval Postgraduate School Catalogue for 1972-1974.

13. J. P. Guilford, Fundamental Statistics in Psychology and Education, Second Edition, McGraw-Hill, New York, 1950, p. 165.

14. Frank S. McKenna, Personnel Selection, Educational Methods, Inc., Chicago, 1967.

15. Lawrence L. Lapin, Statistics for Modern Business Decisions, Harcourt Brace Jovanovich, Inc., New York, 1973.

16. Robert S. Guion, Personnel Testing, McGraw-Hill, New York, 1965.

17. Statistics for Modern Business Decision, p. 126.

18. GRE-Guide to the Use of the Graduate Record Examination 1973-1974, Educational Testing Service, Princeton, New Jersey, 1973.

19. Barbara Pitcher and Philip R. Harvey, Graduate Record Examinations Special Report 63-1, Educational Testing Service, Princeton, New Jersey, April 1963

20. Mehrabian, A., Undergraduate Ability Factors in Relationship to Graduate Performance, Educational and Psychological Measurements, v. 29, 1969.

21. Houston, S. H. and Stromeyer, E., A Study of the Validity of the GRE Battery in Predicting Four Criteria of Success in Doctoral Degree Programs, State Journal, Spring 1970.

22. Jon L. Cook, Predictors of Academic Success of Graduate Students in the Communications Management Curriculum of the Naval Postgraduate School, MS Thesis, Naval Postgraduate School, Monterey, Ca., 1974.

23. Richard V. Dreese and William M. Russel, An Investigation of the Validity of Graduate Record Examination and Certain Personality of Interest Tests in Predicting Academic Performance in the Management Curriculum of the Naval Postgraduate School, MS Thesis, Naval Postgraduate School, Monterey, Ca., 1964.

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